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AVIATION AND AIRCRAFT JOURNAL

Ladislas d'Orcy, Editor
Alexander Klemin
Edward P. Warner
Ralph H. Upson
Contributing Editors

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The Conference and Aircraft

It is becoming increasingly evident that the Washington Conference was called with two primary purposes in view, the limitation of naval expansion and the settlement of certain Far Eastern problems. This is borne out by the fact that all attempts made with a view to cause a serious consideration of other matters have ended with these matters being referred to technical committees, where they were, for all practical purposes, shelved.

This remark applies in particular to propositions tending to limit the development of military air forces. No country appears to be desirous that this question be given extended consideration at the present time. Probably the very newness of the aerial arm makes it difficult to evaluate its actual utility and power.

However, judging from what has been accomplished so far as regards the limitation of naval armaments, we believe that the Conference will have justified its purpose even if it does not attempt to settle all the problems which confront the nations participating. Such of the problems as have not yet been solved can well be left to future meetings when public sentiment will have been prepared to give a well considered opinion on the matter.

A National Aviation Policy

Until some definite plan for the conduct of governmental aviation and the regulation and encouragement of civil air transport is agreed upon by those concerned with the use and development of aeronautics, slow progress will be made in this matter. It is not unnatural that both the executive and the legislative branches of the government are confused when they consider the existing state of aeronautical opinion.

In the government departments where aircraft are employed for one purpose or the other, there is the usual tendency toward decentralization. Each department or bureau contends that its special needs require specialists in the subject, while those who believe in centralization maintain that specialization should begin in the air, and then proceed to adaptation with a full knowledge of the possibilities and limitations of aeronautics. It is apparent that it will be impossible to reconcile the fixed opinions of those who hold opposing views with regard to what is best for their respective departments.

What is needed is a clear thinking leader in the government who is not biased by departmental prejudice in formulating a broad aeronautical policy which would permit of a harmonious expansion of and cooperation between government and civil aviation. Until such a policy is evolved, the whole aeronautical movement will be at a relative standstill.

A Good Bill

The Bill creating a Bureau of Civil Aviation in the Department of Commerce which has been introduced in the Senate by Senator Wadsworth, and in the House by Representative Hicks, is by far the best of the many similar bills that have come before Congress. While it does not differ materially from the previous bill Senator Wadsworth introduced in the Senate on Aug. 22, 1921, which was printed in our issue of Sept. 12, last, the new bill has the merit of a much clearer wording. It is flexible enough in its provisions to permit of application in all possible cases which may be foreseen to arise in connection with air navigation. It answers the purpose of directing civil air transport without subjecting it to crushing limitations or vexatious provisions. It also avoids any conflict with constitutional perogatives.

Unlike other bills framed for the regulation of civil aviation which have previously come before Congress, the Wadsworth-Hicks Bill has elicited no criticism from any aeronautical quarter. Quite on the contrary, it has obtained well nigh unanimous support from governmental, industrial and sport circles. The fact that this bill was introduced in the House by Representative Hicks, whose previous bill (H. R. 271), introduced last spring had at the time the strongest backing in Congress, is but another proof of the excellence of the modified Wadsworth bill.

In view of these considerations we believe that Congress can, at the present moment, give no greater encouragement to civil aviation than by passing the Wadsworth-Hicks bill in the present session.

Air Mail Efficiency

In a recent engineering treatise on the Air Mail Service it is mentioned very casually that our postal airplanes carry on the transcontinental route an average of less than 150 lb. of mail, although their mail capacity varies from 400 lb. to 800 lb.

Why the actual mail load carried should be such a low percentage of the mail capacity is not quite clear. Surely the amount of mail available between New York and San Francisco, even of the first class alone, is vastly in excess of 150 lb. per day. These figures, if they are accurate, certainly do not show that the Air Mail Service is utilized to its maximum efficiency.

On the other hand, the fact that the best air mail machine carries only 800 lb. of mail load for an engine of 400 hp., whereas up to date airplanes of that power can be designed to carry 2000 lb. of pay load over the same distance and with approximately the same speed, merely indicates the mistake of using converted war airplanes for civil purposes. Unfortunately it is always easier to get appropriations for running expenses than for equipment designed to cut them down.

The Wadsworth-Hicks Civil Aviation Bill

Providing for a Commissioner and a Bureau of Civil Aviation

Senator Wadsworth and Congressman Hicks have introduced in Congress identical bills to create a Bureau of Civil Aviation in the Department of Commerce, for the regulation and development of air navigation. This action concurs with the recommendations of the President contained in his special message on the subject of aviation, sent to Congress since the opening of the present session in transmitting the annual report of the National Advisory Committee for Aeronautics.

These bills as introduced have been perfected and agreed upon by all agencies directly concerned with aeronautics, and hearings are expected to be held at an early date. The measures provide for the appointment by the President of a Commissioner of Civil Aviation, who shall prepare rules and regulations for air navigation, including the issuance of licenses for aircraft, aviators, and air stations, and authorizes him to designate and lay out air routes and to study the possibilities for the development of civil aviation in all parts of the United States.

Supported by Administration

The bill in its present form is the result of conferences between the representatives of the Aero Club of America, the aircraft industry, the heads of the Army and Navy Air Services, the Weather Bureau, and the National Advisory Committee for Aeronautics. It is understood that it will have the support of the Administration leaders in Congress.

The text of the bill as introduced in the House of Representatives (H R 9407) on Dec 9 by Representative Hicks is as follows:

A BILL

To create a Bureau of Civil Aviation in the Department of Commerce, to encourage and regulate the operation of civil aircraft in interstate and foreign commerce, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That there is hereby established in the Department of Commerce, under the jurisdiction of the Secretary thereof, a bureau to be known as Bureau of Civil Aviation.

SEC 2. That a Commissioner of Civil Aviation shall be at the head of such bureau, who shall be appointed by the President, by and with the advice and consent of the Senate, who shall receive a salary of $7,500 per annum. There shall also be an assistant commissioner of such bureau, who likewise shall be appointed by the President, by and with the advice and consent of the Senate, who shall receive a salary of $5 000 per annum. The assistant commissioner shall perform such duties as may be prescribed by the commissioner or as may be required by law. There shall be also a chief clerk of said bureau and such other deputies, assistants, and employes as may be required from time to time and as may be authorized by law.

Duties of Commissioner

SEC 3. That it shall be the duty of the Commissioner of Civil Aviation, in conformity with the provisions of this Act, to foster civil aviation in every way possible and to do all things necessary therefor, cooperating with all other established governmental agencies and taking advantage to the fullest degree possible of the facilities they can offer. This shall include the following duties:

(a) To inspect the design and construction and, if approved, to license the operation of civil aircraft, in order to safeguard life and property.

(b) To regulate the navigation and operation of civil aircraft through the establishment of aerial traffic rules and regulations, in order to safeguard life and property.

(c) To designate, approve, and lay out air routes.

(d) To establish and encourage the establishment of landing fields and air stations.

(e) To make recommendations to the Weather Bureau as to the necessary meteorological service.

(f) To study the possibilities for the development of civil aviation in the United States, and to collect and disseminate information in relation thereto.

(g) To investigate, record, and make public the causes of accidents in civil aviation.

(h) To exchange with foreign Governments, through existing commercial attachés, information pertaining to civil aviation.

(i) To operate such aircraft as the Secretary of Commerce may deem necessary for inspecting, licensing, regulating, and controlling the operation of civil aircraft, and the establishment of air routes, landing fields ,and air stations.

(j) To prescribe the manner of using air routes and to utilize air navigation facilities and appurtances.

(k) To prepare and maintain a comprehensive survey and inventory of all industrial and civil aeronautical resources under the jurisdiction of the United States.

SEC. 4 That, subject to the approval of the Secretary of Commerce, and for the purpose of making effective the provisions of this Act, the Commissioner of Civil Aviation shall by regulation provide for—

(a) Licensing pilots and such other persons engaged in the navigation or operation of civil aircraft as may be required for the public safety, and upon good cause the suspension or revocation of such licenses.

(b) The registration, identification, inspection, certification, or licensing of all civil aircraft, and upon good cause the suspension or revocation of such licenses.

(c) The registration, identification, inspection, certification, or licensing of all civil landing fields or air stations, and upon good cause the suspension or revocation of such licenses.

(d) The conditions under which civil aircraft may be used for carrying and transporting persons or property or for the operation of any civil aerial service whatsoever and the licensing of any such service.

(e) The prohibition of the navigation of civil aircraft over such areas as may be specified for military, naval, postal or other purposes, either temporarily or permanently, and either absolutely or subject to such exemptions or conditions as may be prescribed.

SEC 5 That all rules and regulations authorized under the provisions of this Act shall be formulated by the Commissioner of Civil Aviation in cooperation with other established governmental agencies concerned, and they shall then be recommended to the Secretary of Commerce, and upon the latter's approval such rules and regulations shall be promulgated by him and shall have the effect of law and be enforceable from the date of such promulgation unless otherwise provided therein. The Secretary of Commerce, upon similar recommendations, shall have the power to amend, alter, suspend, or revoke such rules and recommendations and to promulgate new rules and regulations from time to time.

Carriage of Passengers

SEC 6 That, subject to the approval of the Secretary of Commerce, the Commissioner of Civil Aviation shall, with the concurrence of other departments of the Government concerned, establish the conditions under which persons may be carried and property imported and exported in civil aircraft from, into, or through the United States, its Territories and dependencies, and to prescribe the areas within which aircraft entering the United States, its Territories, and dependencies or the waters thereof, are to alight and the conditions to be complied with by such aircraft.

SEC 7 That the word "aircraft" as employed in this Act shall embrace every type of flying machine, conveyance, or vehicle now known or hereafter invented, devised, or developed, whether or not used in the carriage or transportation of

persons or property, or without persons or property, flown operated, or navigated in or through the air, and that the term "civil aircraft" as employed in this Act shall embrace all forms of aircraft except those owned and operated by the Army and the Navy.

Unlawful Flying

SEC 8 That it shall be unlawful to fly or to navigate or operate any civil aircraft in violation of the provisions of this Act, or of any rule or regulation promulgated in conformity therewith, or to fly or to navigate or operate any civil aircraft in interstate or foreign commerce, or in, over, upon, or along or through navigable streams, rivers, or waters, or post roads or routes of the United States, or the air or atmosphere above the same, or in, over or through the District of Columbia, the Territories, dependencies, reservations, national parks, or over any place or building over which the United States has jurisdiction, or to maintain or operate any landing field or air station over which the Bureau of Civil Aviation may exercise jurisdiction except in conformity with the provisions of this Act and such rules and regulations as may be promulgated pursuant thereto.

SEC 9 That any violation of the provisions of this Act, or of any rule or regulation promulgated in conformity therewith shall be punishable by a fine not exceeding $1,000 or by imprisonment for a term not exceeding one year, or both.

SEC. 10 That the Commissioner of Civil Aviation and such deputies as he may designate shall have power to conduct hearings, to subpœna witnesses, send for documents and other papers, to administer oaths, and to take such testimony as may be necessary in determining the qualifications of individuals for licenses or registration certificates to operate aircraft, landing fields, or air stations, or in the suspension or revocation of such licenses or registration certificates, or to enable him or them to make effective any of the provisions of this Act or any rule or regulation promulgated in conformity therewith.

SEC 11 That the Commissioner of Civil Aviation is authorized, subject to the approval of the Secretary of Commerce, to fix the fees and charges for such inspection, registration, and licensing authorized by this Act, which fees and charges shall be collected by the Commissioner of Civil Aviation and covered into the Treasury of the United States to the credit of miscellaneous receipts.

Assistance to Civil Aircraft

SEC 12 That for the purpose of encouraging the development of civil aviation in the United States, full cooperation shall be given by the Bureau of Civil Aviation to the owners or operators of civil aircraft, and that the Secretary of War, the Secretary of the Navy, the Secretary of the Treasury, the Postmaster General, and the Secretary of Commerce shall furnish to any owner or operator of civil aircraft landing on an air station or landing field under their respective jurisdictions aviation fuel, oil, supplies, and necessary mechanical assistance of an emergency character, under such regulations as they may approve and promulgate for their respective services. The proceeds from such sales and assistance shall be deposited in the Treasury of the United States to the credit of the appropriations involved.

SEC 13 That the Commissioner of Civil Aviation shall publish periodically a bulletin setting forth all licenses issued or revoked, together with field reports of all flying activities, accidents, and field and route data, under the control of the bureau.

SEC 14. That the Commissioner of Civil Aviation shall annually, at the close of each fiscal year, make a report to the Secretary of Commerce, giving an account of all moneys received and disbursed by him and describing the work done by the bureau, and the Secretary of Commerce shall transmit such report to Congress with the annual report of the Department of Commerce.

SEC. 15 That the district courts of the United States shall have exclusive jurisdiction over all claims and controversies involving aircraft, landing fields, and air stations, their owners, lessees, charterers, and operators licensed hereunder, with the right of appeal as in other cases. The law and procedure to be applied in determining such claims or controversies whereever arising, whether on land, water, or in the air, shall conform as nearly as may be to the principles of law and procedure applied in cases of admiralty jurisdiction. The owners, lessees, charterers, and operators of such civil aircraft, landing fields, and air stations shall be entitled to the same measures of exoneration from the limitation of liability as are provided for the owners, lessees, charterers, and operators of vessels by section 4281 to 4286, both inclusive, of the Revised Statutes of the United States, section 18 of chapter 121 of the Act of Congress of June 26, 1884, and the Acts amendatory thereof and supplemental thereto; and the rules of the Supreme Court of the United States and of the inferior United States courts relating to limitation of vessel-owner's liability as now in force or as may be hereafter promulgated shall be applicable to claims and controversies involving such aircraft, landing fields, and air stations, their owners, lessees, charterers, and operators.

SEC. 16 That all salaries provided herein and all expenses incurred under the provision of this Act shall be paid out of such money as may be appropriated therefor by Congress.

SEC 17 That if any portion of this Act be declared invalid it shall not affect any of the other portions thereof, which other portions shall continue in full force and effect.

SEC 18 That this act shall take effect from and after the date of its passage, and all Acts or parts of Acts inconsistent herewith are hereby repealed.

Civil Aviation Licenses in Canada

The Air Board, Ottawa, Canada, gives a summary of civil aviation certificates and licenses issued, cancelled, renewed and still in force during 1920 and 1921.

During the year 1920, 10 applications were denied, 403 new certificates or licenses issued; 27 lapsed or were suspended; 23 were renewed, in force on December 31, 1920, 375.

During the period January 1, 1921, to October 31, 1921, no applications were denied, 244 new certificates or licenses were issued, 261 lapsed or were suspended, 117 were renewed, making to grand total of certificates or licenses in force on October 31, 1921, of 475.

Ansaldo and SVA Airplanes

Aero Import Corp., of 1819 Broadway, New York, which has been the selling agency in the United States for SVA and Ansaldo planes, has retired from the field. The principal difficulty it is understood has arisen from the corporation assuming storage charges on a large shipment of SVA planes.

Announcement has been made that the American branch of Ansaldo & Co. of 61 Broadway, New York, will hereafter handle the sale of SVA and Ansaldo cabin machines.

Coming Aeronautical Events

AMERICAN

Jan 9—Annual Banquet, Aero Club of America.
Apr. 30—Spring Show and Opening Meet, Curtiss Field, Mineola, L. I.
Sept. 4—Detroit Aerial Water Derby, Detroit. (Curtiss (about) Marine Flying Trophy Competition.)
Sept 15—Detroit Aerial Derby, Detroit. (Pulitzer Tro- (about) phy Race.)
Sept. 30—First Annual Interservice Championship Meet. (In preparation.)

FOREIGN

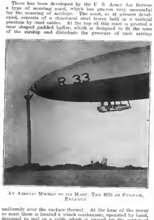
Aug. 1—Coupe Jacques Schneider. (Seaplane speed (about) race.) Italy, probably Venice.
Oct. 1—Coupe Henri Deutsch de la Meurthe. (Airplane speed race.) France.
American elimination trials, if required, to be held about Aug 15, at Mitchel Field, L. I.

A Portable Airship Mooring Mast

A Notable Improvement Due to the Army Air Service

After war operations ceased, the first system for anchoring non-rigid airships in the open air which proved at all practicable was developed in England. This system demonstrated the safe riding of the airship at anchor in reasonably high winds.

There has been developed by the U. S. Army Air Service a type of mooring mast, which has proven very successful for the mooring of airships. The mast, as at present developed, consists of a structural steel tower held in a vertical position by steel cables. At the top of this mast is pivoted a cone shaped padded buffer, which is designed to fit the nose of the airship and distribute the pressure of such airship



AN AIRSHIP MOORED TO ITS MAST. THE R33 AT PULHAM, ENGLAND

uniformly over the surface thereof. At the base of the tower or mast there is located a winch mechanism, operated by hand, designed to reel in a cable which is passed up the center of the mast over sheave wheels at the top and fastened, when the mast is in use, directly to the nose of the airship, which is suitably reinforced to withstand the strain. The mast has been designed with particular reference to portability, being made up in four sections, each 18 ft. in length, making the total height of the mast 72 ft. An erecting derrick is provided, integral with the base of the mast, by means of which the mast may be installed in a minimum length of time. The entire mast may be disassembled into its 18 ft. lengths, placed aboard standard Army trucks, and transported to its new site and there reassembled and erected in a minimum length of time, and with only such equipment as is contained in the mast itself, excepting a few small tools and old pieces of timber, etc., which would be required as dead-men for the securing of the guy cable.

Experiments with the mast conducted at Langley Field have been very successful and, while slight alterations are being made—as is always the case with entirely new designs—the basic idea and general dimensions of the mast, as they were originally designed and as they exist at present, will not be changed to any appreciable extent in future designs for this size of mast. This mast will properly handle ships from the smallest size, i.e., 35,000 cu. ft. capacity, to ships as large as the Roma, which has a capacity of 1,200,000 cu. ft.

Arrangements are being made for the installation of auxiliary devices, such as direct piping, through the mast to the ship, of water, fuel, buoyant gas, compressed air, etc., and doubtless in the future development of this mast these auxiliary devices will receive more and more attention and the mast thereby refined considerably. Masts such as this, located at various points throughout the country, at municipal landing fields, Air Service flying fields, and the various strategic and protected sites, will provide means whereby airships, even to the smallest size, will be able to fly with entire security, traversing the entire country, and thereby establishing new means of rapid transportation.

The operation connected with the landing of an airship and attaching it to the mooring mast is a relatively simple matter, although great caution and skill on the part of the airship pilot are required to insure the security of the craft against damage. Upon approaching the mast, at an elevation of between one and two hundred feet, the mooring line is dropped and the end of it fastened to the end of the mooring mast cable which, as above mentioned, passes up through the center of the pivoted buffer cone over sheave wheels and down the center of the mast onto a storage drum actuated by a hand winch mechanism. The winch is now operated, drawing the ship's nose securely up into the padded cone, and the ship is secure and safe from any damage from ordinary weather conditions, flying from this position exactly as a weather vane does. As soon as the ship is secure, the hydrogen, fuel, air and water lines are connected to the ship, and she is prepared to either take off again on a continuation of her flight or to remain for weeks or months, requiring a minimum of attention upon the part of her crew. To perform the operation above outlined requires the services of but from five to twenty five men, depending upon the nature of the air currents in the vicinity of the mast.

Upon approaching a mast preparatory to making a landing, an airship "weighs-off," i.e., the pilot discharges ballast or gas depending upon whether the ship is "heavy" or "light," until the airship is in static equilibrium, or preferably a little "light," or, in other words, has a tendency to ascend upon the motors being idled and the dynamic effect of the controls neutralized. The ship is then directed toward the mast, approaching nose into the wind. Immediately the mooring cable is attached to the mast winch cable, the propellers are reversed, and a constant tension maintained upon the mooring cable until the ship is secure in the mast. In the absence of reversible propellers a few men are distributed upon the tail, handling guys to steady the ship into the wind and to prevent its yawing and riding up into the mast at too rapid a rate or by surges. While the airship is attached to the mast a single attendant, to maintain constant pressures in the gas compartments and the static equilibrium of the ship, is sufficient.

Aviation in Honduras

According to the November issue of the *Pan American Union*, two young Honduranians have been sent to the United States by the Government to study aviation. An aviation school is in course of construction and will soon be opened. The Minister of War and Navy, who believes that aviation should be introduced into Honduras for official and commercial purposes, suggested that the officers and men connected with the Department of War and Navy give one day's salary to the aviation committee as a contribution to flying machines, and his suggestion was received with great enthusiasm. This means thousands of dollars toward the aviation fund.

Naval Aviation *

Rear Admiral Wm. A. Moffett
Chief of Bureau of Aeronautics

Aerology

Officers and men have been trained in aerology and detailed as stations. They have been primarily engaged in furnishing weather reports for flying operations conducted from naval ships and stations. Mutual arrangements for a systematic interchange of weather reports have been made between the Navy and the Weather Bureau. A service has been inaugurated in cooperation with the Weather Bureau and Naval Communications for broadcasting a special report for aviation and marine stations from Arlington, which covers the east coast of the United States and adjacent marine areas. A similar service has been agreed upon and is in the process of preparation to cover the west coast, and also one to cover the Gulf of Mexico and central area of the United States.

Arrangements are being made to have reports broadcasted from Point Isable, which will include the observation made in the Gulf coast, at Jamaica, and Swan Island (Caribbean Sea), sent to Coco Solo.

Arrangements have been made permitting naval radio stations to transmit to neighboring naval air stations direct and to the Weather Bureau, the weather reports received from ships at sea. Arrangements have also been made at Coco Solo to have ships entering and leaving the Canal Zone send back weather reports while within radio communication. Steps have been taken to arrange for a world meteorological broadcasting system by radio, but to date these have not been acted upon by the international communication conference.

The aerological service is of the greatest importance to safe aerial navigation and the greatest effort should be made to perfect it.

Personnel

On June 30, 1921, the officer personnel on active aviation duty was

	Regular Navy	Temporary	Naval Reserve (Class 5 active)
Aviators	72	44	264
Student aviators	34	34	5
Ground officers	24	24	21
	130	102	290

Naval warrants	
Student aviators	29
Ground officers	29
	58
Total officers	580
Marine officers	
Commissioned officers	56
Warrant officers	6
Total officers	62

The number of enlisted men employed on aviation duties June 30, 1921, was

Naval aviation ratings	3,494
General ratings	1,385
Enlisted men (Marine Corps)	872
Total	5,751

An examination of temporary and reserve officers for entrance into the regular Navy as commissioned officers was held in May, 1921. One hundred and sixty aviation officers were recommended for commissions in grades as follows: 48 lieutenants, 35 lieutenants (junior grade), and 77 ensigns. Thirty-four aviation chief warrant and warrant officers were recommended for warrant commissions in the regular service as follows: 9 boatswains, 7 gunners, 3 chief machinists, 11 machinists, 2 chief carpenters, and 2 carpenters. Fifty-eight per cent of the temporary officers and 62 per cent of the reserve officers who took the examination were recommended as qualified for a commission. To date all officers recommended for commissions or warrants have not signified their intention of acceptance.

Training

Cooperation wherever possible in the matter of training pilots has existed between the Army and the Navy. The training school at Pensacola for both heavier and lighter than air has been continued. This school teaches theoretical and practical subjects in all branches of naval aviation. Nineteen thousand eight hundred and forty-four flights totalling 18,364 hr. have been made.

One thousand nine hundred and sixty men have been trained as aviation mechanics of all kinds at the aviation mechanics school at Great Lakes, Ill.

A post graduate course at the Naval Academy has been inaugurated to train naval aviators as highly technical officers for solving the many difficult problems in design met by the air forces of the fleets.

Air Stations

A minimum number of air stations necessary for the proper training of personnel and operation of aircraft with the fleets has been maintained throughout the year. The following stations have been in operation: San Diego, Calif.; Hampton Roads, Va.; Anacostia, D. C.; Pensacola, Fla.; Lakehurst, N. J.; Rockaway, Long Island. Outside the continental United States: Coco Solo, Canal Zone; Pearl Harbor, Hawaii. Stations under the Marine Corps: Quantico, Va.; Parris Island, S. C.; Port au Prince, Haiti; Santo Domingo, Dominican Republic; and Guam.

In the interests of economy, the following stations have recently been closed: Rockaway, Long Island; Yorktown, Va.; Cape May, N. J.; and the marine station at Parris Island, S. C. With the same object in view, actual operation of aircraft from Lakehurst, N. J., has been eliminated, and all lighter-than-air operations at Pensacola, Fla., have been discontinued. Considerable reduction in the operation of planes at the stations at Hampton Roads, Va., and Coco Solo, Canal Zone, has been effected.

Pearl Harbor, Hawaii.—During the year contracts have been let for building a naval air station on Ford Island. Satisfactory progress is being made. It is expected to open this station at some time during the coming year.

Great Lakes, Ill.—The training of the aviation enlisted personnel has been continued at Great Lakes. A school completely equipped for training aviation mechanics, carpenters, fabric workers, metal workers and all the trades necessary to aviation, was started at Great Lakes, in 1917. The activities of this school have been greatly reduced. During the last year the courses have been perfected and the syllabus modified to meet the reduced activities.

Fleet air forces.—The work accomplished by the Atlantic and Pacific Fleet air forces has been most satisfactory. The Pacific Fleet air force devoted itself chiefly to the development of the ship planes, i.e., those planes that operate from battleships, the perfecting of the doctrine and tactics to be used in spotting of gun fire, while at the same time their large flying boats have successfully accomplished a long flight to the Canal Zone and return.

The work of the Atlantic Fleet air force has been in the nature of scouting and the offensive side of aviation, long-distance overseas flights, the development of doctrine and tactics for offensive bombing. This force also has accomplished successfully a long flight from Philadelphia to Panama and return. Aside from the flying involved in these long flights by both the Atlantic and Pacific air forces, the following additional problems have been undertaken:

* From the Annual Report of the Secretary of the Navy. Concluded from our preceding issue.

(a) The bombing of the Indiana to determine the percentage of hits.
(b) The bombing and sinking of the U-117 and the search and dummy bombing of the radio controlled battleship Iowa.
(c) The development of smoke screens.
(d) The development of targets for anti-aircraft fire.
(e) The perfection of a torpedo for use from aircraft.
(f) The development of communications and direction finding from aircraft.

Marine stations.—The following organization of marine aviation forces has been approved during the year:

First Air Squadron, Santo Domingo City, Dominican Republic:
- Flight A.
- Flight B.

Second Air Squadron, marine flying field:
- Flight C, marine barracks.
- Flight D, Quantico, Va.

Third Air Squadron, marine flying field:
- Flight E, marine barracks.
- Flight F, Quantico, Va.

Fourth Air Squadron, Port au Prince:
- Flight G, Republic of Haiti.
- Flight H.
- Flight I, Guam.

United States Marine Corps:
- Marine aviation detachment, marine flying field, Marine Barracks, Parris Island, S. C.

During the year the Marine Corps has made 3,364 flights, totaling 4,681 hr. or 300,285 miles.

The construction authorized during the past year at the various marine flying fields has been practically completed.

Quantico, Va.—The operations of the marine flying field at Quantico have consisted of the following:

Drilling and tactical exercises with the ground troops. Considerable night flying has been performed, including maneuvers with the searchlight battalion, mapping of the Marine Corps reservation, cross-country flying for the purpose of locating air routes and new landing fields. Advance training of pilots has been actively carried on. The flights have covered practically the entire eastern United States from Rhode Island to South Carolina as far west as the Allegheny Mountains.

A flight of two DH-4 planes successfully completed the trip from Washington, D. C., to Santo Domingo City, Dominican Republic, and return in 46 hours and 17 minutes. A flight of DH-4B's participated in the bombing off the Virginia Capes against the Iowa. The Secretary of the Navy, Assistant Secretary of the Navy, and other Government officials have been taken on numerous flights.

Parris Island, S. C.—The work of this station was confined to the locating of various air routes and landing fields and cooperating with towns and cities in establishing municipal fields. This station is now on inactive status.

First Air Squadron, Santo Domingo City.—Routine patrol work in search of bandit activities has been carried on. The First Air Squadron is operating on regular schedule an air mail service between various cities and organizations. The duties of this squadron include the carrying of doctors and medicines on emergency calls to points in the interior, some of which it would take a week to reach by any other method of transportation, and which an airplane can reach in a few hours, the carrying of sick or wounded men to hospitals, taking mail and dispatches to various companies and battalions which are scattered about in inaccessible places throughout the interior. Mapping and photographic work has been accomplished.

Fourth Air Squadron, Port au Prince, Haiti.—The operations of the Fourth Air Squadron are practically identical with those of the First Air Squadron at Santo Domingo City. In addition, flying boats are operated on the coast of Haiti to points not having a landing field.

Flight "I," Guam.—A small air detachment has been sent to Guam for the purpose of studying the local conditions and gathering meteorological data. To date no flying operations have been accomplished.

Training

Officers of the Marine Corps during the past year were trained at Pensacola and also in the Army Pursuit School at Carlstrom Field, Fla. Four hundred and six enlisted men have completed one or more of the various courses at the Aviation Mechanics School, Naval Training Station, Great Lakes, Ill.

Aeronautical Board

Valuable work in preventing duplication and in reconciling aviation problems between the Army and Navy has been accomplished during the year by this interdepartmental board.

National Advisory Committee

The National Advisory Committee, in which the Navy is represented, has rendered during the past year valuable assistance in scientific and technical matters pertaining to aviation.

Bureau of Aeronautics

In accordance with an act of Congress, the Secretary of the Navy issued orders for the establishment of a Bureau of Aeronautics to begin operations Sept. 1, 1921. The organization was begun on that date with Rear Admiral William A. Moffett as chief of bureau. The establishment of this bureau is a very encouraging and important action on the part of the Government and the Navy Department. Inasmuch as it gives opportunity for coordinating activities concerning all aeronautical problems coming under the jurisdiction of the Navy, it reduces lost motion to a minimum and brings about economy of operation with a reduction in overhead costs, and at the same time places the chief of the bureau on a par with chiefs of other bureaus in the Secretary's council.

Flight operations at air stations and with fleet air squadrons, fiscal year ending June 30, 1921.

Unit	Seaplanes and airplanes Flights	Hours	Minutes	Airships Flights	Hours	Minutes
Anacostia	1,985	1,084	53			
United States Atlantic Fleet						
U. S. S. Shawmut	193	377	4			
Mitchel Field	804	143	1			
United States Pacific Fleet U. S. S. Aroostook	2,387	4,329	58			
Coco Solo	3,153	3,048	48	10	28	30
Great Lakes	3,006	558	41			
Hampton Roads	2,782	4,049	33	141	384	50
Pearl Harbor	1,310	870	43			
Pensacola	15,208	16,223	50	884	1,245	1
Rockaway	1,541	1,518	12	94	174	11
San Diego	3,030	2,183	4	428	547	46
Parris Island	1,486	1,373	49			
Port au Prince	1,851	1,238	55			
Quantico	2,034	2,208	37			
Santo Domingo	825	998	57			
Guam	88	60	47			
Total	45,501	37,247	41	1,587	2,228	30

Unit	Kite balloons Flights	Hours	Minutes	Free balloons Flights	Hours	Minutes
United States Pacific Fleet U. S. S. Aroostook	162	85	5	4	4	32
Coco Solo	184	58	58			
Hampton Roads	187	24	58	5	38	50
Pensacola	412	327	31	142	558	25
Rockaway	14	28	20	4	42	45
San Diego	270	68	10	13	20	34
Total	1,253	588	137	175	875	54

Approximate miles flown

Heavier than air	2,421,055
Lighter than air	90,000
Total	2,511,555

Chamberlin Aircraft

The Chamberlin Aircraft Co. of Hasbrouck Heights, New Jersey, report numerous inquiries in response to recent advertising of Standard planes which the company has been rebuilding for Hispano-Suiza and Isotta-Fraschini engines as three, four and five place passenger ships.

C. A. Chamberlin stated that he had recently concluded two sales and from the inquiries he is receiving feels considerably encouraged in regard to further sales of planes during the winter months.

Development of an American Pursuit Engine

From the American Built Hispano to the Wright "Superfighter"

Pursuit aviation. A common phrase now, but how recently coined. To write about it in America would seem on the surface somewhat like writing a life history of a three year old child. But, if one digs down underneath the surface, one will find that a very considerable progress has been accomplished in this phase of aeronautical activity in the United States since the signing of the armistice. Pursuit aviation naturally divides itself into pursuit planes and pursuit engines, and it is with the latter that this article primarily deals.

The European governments only began to take aviation seriously a very few years prior to the outbreak of the European war. Our own government did not do so until it was actually engaged in hostilities three years later. While this particular branch of aeronautics, in common with others, has suffered somewhat since the war, from a governmental sense of economy, nevertheless, despite that, the building and designing of pursuit engines has progressed in America in a most satisfactory fashion, and this is the story of that development.

Flying in 1914

To revert to the beginning, flying was still a great novelty in 1914. Races had been held in France and engine competitions in Germany, both of which stimulated development and brought before the military authorities the importance of aviation. At the opening of hostilities, we find the armies used the very few airplanes they had entirely for reconnaissance and observation. Gradually the pilots began to carry shot guns and pistols, and finally pursuit aviation developed very fast single seater ships, armed with machine guns. These guns were at first fired through the propellers unsynchronized, which resulted in a number of accidents, and prompted the development of synchronizers, which operated the guns so as to shoot between the propeller blades. The object of these planes became very definite, namely, to obtain and maintain control of the air, thus permitting observation and bombing operations to continue over the enemy's territory unhindered.

George J. Mead, Chief Engineer, Wright Aeronautical Corp.

Pursuit aviation became a race, and it soon developed that the supremacy of the air depended upon the speed and maneuverability of the pursuit ships. Great speed alone availed nothing without maneuverability or the ability to climb rapidly, turn quickly, and dive at a tremendous speed. These qualities required that the plane itself be of the smallest possible dimensions, particularly in wing spread. For these really small airplanes the maximum power is required from the weight that can be allowed for the power plant. For maneuverability, the engine had also to be very compact. It was only by placing the engine, the pilot, and the fuel in the smallest possible space, that the best maneuverability was secured. Every one is familiar with an experiment, which shows the necessity of such an arrangement, namely, trying to change at each end, and held in the middle, in contrast to changing the direction of the same combination with the weights close in at one's hand. In this service, everything is sacrificed for speed and maneuverability, the factors of safety being cut to the minimum, even to the point of reducing the life of the plane and engine, in order to gain a few more miles an hour in speed. Utmost performance is required.

In 1914, the French pinned their faith on rotary air-cooled engines, such as the Gnome and Le Rhone. The ships equipped with these engines were quite maneuverable, due to the compactness of the power plant and the concentration of the weights. However, it was impossible to increase the power of the rotary engines to meet the rapidly rising power requirements of pursuit aviation. The French soon found that the rotaries, which due to their lightness, had more or less directly enabled successful flight in the early days, must be abandoned, since their power was limited by their speed of rotation. Incidentally, as the rotary engines reached their maximum dimensions, their gyroscopic action proved more and more detrimental to maneuverability. This same factor was seriously impaired by the inability of these engines to be run at very high speeds. The ship's diving speed was thereby limited. Centrifugal force became the limiting factor, as to prevent the cylinders from leaving the crankcase, the pilot must not exceed a predetermined engine speed, which in turn limited the diving speed. In this connection, it is interesting to look at the instrument boards of the Nieuports and see the warning, "Maximum speed of revolution must not exceed 1400 r.p.m."

The war had, of course, put an end to the demand for high priced motor cars, and many European designers, therefore turned their attention to aviation. Among these was Marc Birkigt, a Swiss engineer, who had been unusually successful in developing a high grade motor car, the Hispano-Suiza. Mr. Birkigt designed an aviation engine, which proved to be the salvation of the Allies in the air. It was called after the motor car produced by his company, and proved to be the first successful water-cooled engine having a weight per horsepower less than that of air-cooled rotaries. It was, moreover, almost as compact as they were. The French took up its manufacture in earnest, using it as their standard pursuit engine, and at the close of the war there were twenty-two plants engaged in producing it.

The German military authorities gave considerable attention to aviation prior to the war, and encouraged the development by their large automobile companies of aeronautical engines. In this way, they were able to bring to bear on this problem, all their experience with high speed internal combustion engines. It is interesting to note that the Mercedes racing cars, which won the Grand Prix in 1914, were really testing the type of engine adapted as their standard aviation engine at the beginning of the war. The Hispano-Suiza engine upset their standard, which was a six cylinder, vertical, water-cooled engine, owing to its success in the famous Spad, held in reverence by all the Allied Air Services. It has only recently been shown how serious a menace this engine proved to the Germans. We find now, that the first of these engines captured in Germany was very carefully studied, and plans made for the production of this type.

When the United States Entered the War

When the United States entered the war, we had only a few training planes and no fighting ships at all. The Government had not seen the value of aviation and, therefore, had not encouraged its development in this country, as had been done abroad. We had, therefore, very little of an aviation industry, with its trained engineers and artisans, and were, therefore,

totally unprepared, as a country, to supply either planes or engines. In an endeavor to make up for this deficiency with the least loss of time, the Aircraft Production Board was organized. After mature consideration, and heeding the advice of the Allied representatives, it was determined that our initial program should consist of observation and bombing planes and engines, as assistance was at that time urgently needed in this type of equipment. The Board set out, with the aid of several well known engineers from the automobile industry, to design what is known as the Liberty engine, the idea being that this would be a standardized all purpose engine, which could be built by all the automobile manufacturers in great quantities. The original intention was to build 6, 8, and 12 cylinder types, using certain parts interchangeably in all three. Experimental models of the "8" and "12" were built and tested, but it was decided that at least 400 hp was essential for the type of ships that it had been determined were to be built in this country. Our aviation activities were then directed toward producing sufficient planes and engines for the complete destruction of Germany by bombing, and production was, therefore, planned for deHaviland planes and Liberty "12" engines. The Liberty "12", which was designed for bombing and observation ships, proved to be very satisfactory for this work, and still is. After this decision to specialize on deHaviland "4's" and Liberty "12" engines, which included, of course, a training program, it was necessary to turn to France for pursuit planes and engines. France was able at first to produce a sufficient quantity of this kind of equipment for our use, and no attempt was made to enter into its production in this country.

In 1915, the Wright Company decided that there was a possibility of considerable business in the production of aviation engines. For this reason, Henry M. Crane, chief engineer of the company, went abroad to investigate the engine situation in Europe. After carefully going over the designs of the various engines, he decided that the Hispano-Suiza, which had just then come into prominence, was the most efficient type and had the greatest possibilities for further development. Arrangements were then made with the parent company to license the Wright Co. for the manufacture of these engines. In the meantime, the Wright Co. had absorbed the Simplex Co., whose plant was located in New Brunswick, and there undertook the construction of 450 engines for the French government.

First American Built Hispano

The original engine, known as Model "A" in this country, was an eight cylinder, water-cooled, 90 deg. Vee engine, having an approximate bore and stroke of 4¾ in. x 5 in. This engine developed 150 hp., at 1450 r.p.m. and weighed 438 lb. Its design embodied many novelties, the principal of which were the cylinder blocks, method of valve operation and the connecting rods.

The facilities of the Simplex Automobile Co. were among the best of any of those in this country, engaged in the manufacture of high grade automobiles. Not only was this true in regard to machinery, but to the personnel, as well, which had long been identified with this industry. It seemed at first as though it would be a relatively simple matter to have such an organization to take up the manufacture of a present aircraft engine. Despite the equipment, and the experience of the personnel, the task proved to be an enormous one.

The French drawings, from which they were to work, were all in metric measure, and very few, if any, limits or tolerances were stated. This meant at first, that the drawings must be entirely redrawn to American standards, and that limits had to be established for the fit of the various parts. Tools and fixtures had to be designed for the production of these parts. The castings, particularly the cylinder block and upper crankcase, involved intricate foundry problems. The best foundries in this country were unable to solve them. At that time very little experience was available in the aluminum industry with anything but very simple castings, and therefore a foundry had to be developed for their production. The French standards of steel had to be translated into commercially procurable material in this country, and the heat treatment of these materials developed, as the major parts of a pursuit engine are very highly stressed, in order to reduce the weight as much as possible. Suitable accessories, such as magnetos, carburetors and spark plugs, were not at first available in this country. The magnetos and carburetors had to be imported from France for the first 450 engines. Gradually, American sources of supply were developed for these items. By the time all these matters had been straightened out, and the first engines were actually assembled, the problem of the proper testing equipment came up. The most satisfactory means of test proved to be reaction stands, in which the engine was run with a flat bladed propeller or club. Following the preliminary tests, 50 hr. runs were required by the French government. With the proper tolerances finally set, a 50 hr. run was accomplished without difficulty, and production was begun on these engines. This is an interesting example of the fact that no matter how good the equipment in machinery and men, without the "know how," satisfactory production of such a highly specialized engine cannot be secured.

The Geared Model

A constant effort to secure better plane performance led to the gearing of the engines. At first, the regular Model "A" was redesigned to incorporate a pair of spur gears, one on the crankshaft and one on a propeller shaft, thus permitting the engine to turn up to 2000 or 2200 r.p.m., and leave the propeller speed the same as used with the direct drive engine, namely, about 1400 r.p.m. These engines developed between 200 and 220 hp., but it was found that the gearing was difficult to manufacture in quantities with sufficient accuracy to insure satisfactory life. About this time, higher compressions were tried and it was found that in pursuit planes it was possible to turn the propellers much faster than was originally believed possible without excessive slip, so that the geared engines were dropped and the compression of the standard engine boosted, and the propeller speed allowed to run as high as 2000 r.p.m. This made available the same power as was obtained with the geared engines, without the complication and weight.

By this time considerable experience had been gained from the manufacture and operation of a large number of Model "A" engines. Beside this, a number of experimental models of geared engines had been made. It was felt, however, that this type was not satisfactory, and the development was therefore undertaken of a high compression type, known as Model "E", which varied considerably from the French engine of this type, and incorporated changes which were found necessary for the improvement of the engine's performance. A new type of connecting rod was used, known as the marine rod, pistons were of the non-ribbed type, American carburetors, magnetos and spark plugs had been developed, which were superior to those available abroad, so that the engine now commenced to be an American engine. A great number of these were shipped overseas for use by the Allies, and went to the front in SE-5 planes built abroad, as there were no American built pursuit planes at that time. It might truthfully be said that this was the first American Pursuit Engine.

Hardly had these engines been put into service, than the demand came for greater power. Both the Hispano-Suiza Co. in France and the Wright Co. in this country, started in 1918 the development, almost independently, of a larger edition of the original engine, which should develop in the neighborhood of 300 hp. Both the French and American experimental engines were completed about the same time, and the French engine proved to be almost an exact enlarged copy of their high compression small engine, whereas the engine developed here, called the Model "H," was considerably different, even from the Model "E," which was then being produced.

To begin with, the American type used a bore of 140 mm. and a stroke of 150 mm., whereas the French originally made their engine 140 mm. square. The American type had the marine type connecting rods, and the rods were considerably longer than the French type, in order that the piston should not travel down into the crankcase, thus collecting oil. The design of the cylinder block casting was changed in order to carry water completely around the exhaust valves. This was accomplished by a slight increase in height and by making the exhaust ports elliptical in shape. A much higher lift was

used on the cams, and the cam contours considerably changed. The compression ratio was made the same as on Model "E." The result of these changes enabled the American engines to develop more power than the French of the same type, with very little increase in weight. The average power developed at 1800 r.p.m. was 325, with a fuel consumption of 0.50 lb. per hp. hr. The weight worked out to be 1.92 lb. per hp., which showed this engine to be the lightest of any thus far produced.

Model "H" Engine

During the summer of 1918, it became apparent that, if the war continued for a long period, a greater volume of pursuit type planes and engines would be required than the Allies were capable of producing. Fortunately, the Wright Company had largely developed the Model "H" engine, and it, therefore, followed that arrangements were made for the extensive production of this type engine. The armistice, however, cut short this development and production, after only a very few engines had been built. Equipment and facilities were about ready to produce great quantities of these engines, but the close of the war brought about their disintegration.

Therefore, it came about after the war, that the problem of the American Air Service was to develop and produce pursuit

The 400 Hp. Wright "Superfighter" Engine. Developed for Pursuit Aviation

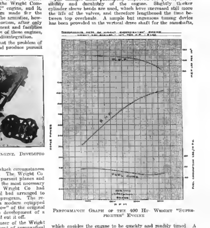
type planes and engines, and fill the void which circumstances during hostilities had of necessity caused. The Wright Co. was quick to recognize that in the field of pursuit planes and engines was the opportunity to accomplish the most necessary and worth while work. Meanwhile, the Wright Co. had undertaken a complete reorganization and had arranged to continue on a much reduced peace time program. The reorganized company, with ample capital, a modern equipped plant, and all the experience and "know how" of the original company, then prepared to undertake the development of a pursuit type engine where the armistice had cut it off.

George J. Mead, the present chief engineer of the Wright Co., had been associated with the development of aeronautical engines since the time of the first work of the Simplex Co., and had been with that company even before that period. A careful study was made by him of the different types of engines developed during the war, in an effort to determine which type was the most efficient and embodied the greatest possibilities for future development. This study included such engines as 6 cylinder verticals, 8 cylinder Vees, 12 cylinder Vees, radials and rotaries. Each type was measured by the requirements of pursuit aviation, such as weight per horsepower, compactness, which involved not only length but head resistance, ease of overhaul, durability and manufacturing possibilities. The result of this work was the decision to continue the development of a water-cooled, 90 deg. Vee engine, as this type for pursuit work had no rival, considered both from design possibilities and the actual performance of engines of this type. Not being satisfied with a purely academic investigation, designs were made of several of the types, which came most nearly to competing with the Vee 8. The result of this work was only to show still more convincingly the superiority of the 8 cylinder Vee engine. The actual performance of this type has since thoroughly substantiated this decision.

Mr. Mead had been particularly identified with the Model "H" development and, therefore, was the logical man to undertake the evolution of the old Model "H" in to the Model "H-3," which is now the standard type of pursuit engine for the American Air Service.

Model "H-3" Wright Engine

The changes made principally improved the power, accessibility and durability of the engine. Slightly thicker cylinder sleeve heads are used, which have increased still more the life of the valves, and therefore lengthened the time between top overhauls. A simple but ingenious timing device has been provided in the vertical drive shaft for the camshafts,



Performance Graph of the 400 Hp. Wright "Superfighter" Engine

which enables the engine to be quickly and readily timed. A new magneto bracket has been provided, known as the inclined bracket, which carries the magnetos in such a position as to permit the engine bed timbers to run straight through without having to be cut as required by the original magneto bracket. A change has been made in the carburetor, which permits better fuel economy when the engine is throttled for cruising. The oil suction pipe, which originally ran along the bottom of the crankcase on the outside, has been moved to the side of the case, thus making it possible to get at the water pump packing and remove the oil pumps. The engine has been provided with a complete water piping system, as a part of its own equipment, so that it is only necessary in the airplane to make three water connections, one to the pump and one from the top of each cylinder block to the radiator. In the same way, all airplane connections have been reduced to a minimum to facilitate installation and removal of the engine. The mani-

fold tee is piped up in such a way that hot water is continually drawn through the tee by the water pump. The oil strainer has been reinforced to prevent its bursting in cold weather, and all the exposed steel parts of the engine have been rust proofed. Four narrow rings are now used on the pistons, and the piston pins retained by means of bronze plugs instead of the aluminum cored pieces originally used. The compression ratio of this engine is slightly higher than Model "H," now being 5.5 : 1, which gives a better performance at altitudes. These engines average 340 hp. at 1800 r.p.m. at sea level, with a weight of 620 lb., which gives a weight factor of 1.82 lb. per horsepower.

The Wright "Superfighter"

Facing the need of a superperformance engine, the "H-3" was still further developed into what is called the "Superfighter." The engine develops 400 hp. at 2000 r.p.m., and weighs 610 lb., which gives a weight ratio of 1.5 lb. per horsepower. It has the lightest weight per horsepower and is the most compact pursuit engine in the world. The fuel consumption is 0.46 lb. per hp. hr., and oil consumption 0.015 lb. per hp. hr. Particular attention has been given to altitude performance, so that the engine is far superior to the original models above 15,000 ft. For this purpose, these engines have a compression ratio of 6.5 : 1, and cannot be operated with full throttle at sea level without the use of special fuel.

The difficulties involved in obtaining such performance figures as noted above for the "Superfighter" are tremendous, owing to the limitations under which the designer must work. To get the maximum horsepower without a weight restriction would be comparatively easy, but to get the maximum horsepower with the minimum weight per horsepower, is a very difficult problem. Weight does not have much effect upon speed, except when gravity has to be overcome, such as occurs when an airplane is climbing. Two hundred pounds additional weight in a given airplane reduces its rate of climb at 15,000 ft. 60 per cent. Not only must a very high power weight ratio be obtained on the ground, but it is essential that it be retained at high altitudes. This involves the difficulties of temperature and pressure, as pursuit ships often operate between 15,000 and 20,000 ft., where the temperatures are well below zero all the year around, and the air pressures about half of that at sea level.

American Pursuit Airplanes

Hand in hand with the development of engines, has gone the development of American designed pursuit ships. The accomplishment in this field cannot be underestimated, and great credit should be given to the pioneers in this work, such as Thomas-Morse, Loening and Ordnance companies, as well as the Engineering Departments of the Army and Navy. The Thomas-Morse MB-3, equipped with the Wright "H-3," is now the adopted standard pursuit equipment for the U. S. Army Air Service. It is a demonstrated fact that the performance of this ship, both as to speed and maneuverability, greatly exceeds that of the ships used by the Allies at the close of the war, and is at least on a plane with their best development since the war. This conclusively proves that both the Army and Navy Air Services, and the industry, have made great advances during the past three years, and apparently the big gap in a well balanced air service equipment has been spanned.

The foregoing article has dealt with the origin and development of the present standard American pursuit engines. It is well to sum up, in closing, the lessons which can be learned from its development, as our supremacy in the air, in case of war, depends upon our pursuit ships and engines. First and foremost, therefore, we cannot, as a country, afford to lessen our efforts to have available the best pursuit engines in the world, and the organization with the necessary "know how" for their production. The best engineering brains in this country cannot be relied upon to keep us up-to-date in aviation, except by continual painstaking effort properly directed and encouraged. The rate of progress in the development of this type of equipment is briefly contained in the fact that at the time of the armistice, the highest speed of the standard pursuit type ships actually in service was approximately 120 m.p.h., as compared with the present Thomas-Morse MB-3's performance of approximately 160 miles, equipped with its full military load. It is reasonable to believe that almost the same rate of progress will be obtained for some years to come, which clearly shows the necessity of future intensified development of equipment of this type. It should also be clearly understood that experimental work only, does not develop equipment and "know how." Production of successful types, in the course of smaller peace time lots must be maintained, if we expect to keep fully abreast of the development in the other countries.

The late war has demonstrated effectively to this country that, at least in a new article, considerably more than money and even extraordinary plant facilities is necessary for production. Congress was willing to appropriate any sum of money to get aircraft. Patriotic manufacturers were willing to give over their complete facilities, but lack of "know how" threatened disaster in this field of endeavor, and the only remedy for this for the future is the maintenance of a sound, intelligent aircraft industry. It certainly seems to be a good insurance against the possibility of our being as unprepared in the air as we were in 1917, and it should always be remembered that pursuit aviation is even now our first line of defence in case of war.

Aeronautics in Australia

Very little is known in this country regarding the aeronautical activities which obtain in the Commonwealth of Australia. As a result it may come as a surprise to Americans to hear that there are some sixty privately owned airplanes, as distinct from those used for commercial purposes, and some 140 military aircraft, in Australia.

We are indebted for these facts to a letter received from Edward J. Hart, editor of *Aircraft*, a monthly aeronautical magazine published by the Aircraft Press in Sidney. Mr. Hart also points out that Australia has an Air Navigation Act which provides for a Controler of Civil Aviation, superintendents of aircraft, airdromes and of flying operations, an Air Defense Act, a Royal Australian Air Force and Naval Air Service, and an Aeronautical Inspection Department.

Australia being a signatory to the International Air Convention, Australian aircraft, pilots, ground engineers and airdromes are licensed by the government in accordance with the provisions agreed to in Paris. Up to Oct. 20, 1921, there had been issued fifty-three commercial and private pilot's licenses, eighty-seven ground engineer's licenses, forty-nine aircraft registry certificates, thirty-two airworthiness certificates, and five airdrome licenses.

The nationality mark of Australian civil aircraft consists of the three-letter group G-AU, the letter G being the British nationality mark, while AU stands for Australia. The two remaining letters of the five-letter group specified by the International Convention form the registration mark proper.

The Australian government recently granted a subsidy of £25,000 for an air mail contract over an 1100-mile route in northwestern Australia.

S.A.E. Tachometer Standard Revised

The Aeronautic Division of the Society of Automotive Engineers Standards Committee has recommended that certain revisions be made in the present S.A.E. Standard for Tachometer Drive. These revisions are recommended because experience has indicated that the present standard dimensions for the shaft connection on the engine end are not of suitable proportions to insure freedom from trouble. This is especially true in the operation of the centrifugal type of tachometer which turns faster than indicated speed. Breakage has therefore resulted through the use of the present dimensions even though special alloy steels have been used for the shaft.

The Aeronautic Division recommends an increase in the diameter of the driving shaft from 0.152 to 0.187 in. and an increase in the diameter of the hole for the driving shaft from 0.161 to 0.191 in. These recommendations will be acted upon at the next meeting of the Standards Committee on Jan. 10 in the Engineering Societies Building, New York City.

The Seventh Paris Aero Show

(Continued from the last issue)

F. B. A.

The F. B. A. company (the initials of which stand for Franco-British Aviation) exhibited a pusher biplane flying boat equipped with an amphibian landing gear. This machine, which is known as Model M. 1, is fitted with a 420 hp. Darracq Coatalen (Sunbeam license) engine.

Constructionally it does not present any new development, save for the amphibian gear. The wheels are mounted on steel triangles which can be raised or lowered by means of worm gear operated by the pilot. The base of these triangles pivots around a horizontal axis which is parallel with the longitudinal axis of the boat. When the gear is raised the wheels lie flat against the wings. The general arrangement of this gear is illustrated in the accompanying outline drawings (J).

Avions Hanriot

This firm had on exhibit the HD-22 duralumin racing monoplane which was described here in connection with the Deutsch Cup race, the HD-14 two-seater school biplane (80 hp. Rhone), which was also described some time ago in AVIATION AND AIRCRAFT JOURNAL, and the HD-18 airplane, which is the latest product of the Hanriot firm.

The HD 18, which is officially described as a "foreign operations" airplane, is equipped as a three-seater, with a gun turret in the rear. The machine is entirely built of metal including the covering of wings and fuselage. The latter is built up of duralumin tubes except for the engine bed, which forms a separate unit and which is built of sheet duralumin. The latter is shown in the line drawings (I). All fittings are of sheet steel. The wings are built up on two duralumin box spars and lattice work ribs.

Latecoere

The Latécoère company, which operates the France to Morocco air line, exhibited two passenger carriers, one three-engined and one single-engined.

Of the two passenger carriers the three-engined model, LAT4, accommodating twenty passengers, is of composite construction: the wings are of wood, fabric covered, while the fuselage is built up of channel section duralumin girders which meet at six-way junctions and so form a sort of a basket work. Built-up duralumin bulkheads act as spacers in the fuselage and contribute to its rigidity. The resulting structure appears to be very strong and very light at the same time. Of the three engines two are carried outboard in streamlined nacelles, which are mounted on the lower wings, while the third engine is fitted in the nose. This machine may be seen in the upper right hand corner of Fig. 1, and also in the upper left hand corner of Fig. 4.

The single-engined Latécoère passenger-carrier, LAT8, is of a construction similar to that of the LAT4, except, of course, that no outboard engine nacelles are fitted.

The LAT6, the central portion of which is shown in the line drawings under (L), is a "bombardment protection airplane," and was built for the French air service. This machine was not exhibited at the show, and particulars of it are not available save that it is entirely built of duralumin, including the covering of wings and fuselage, and that the power plant consists of four 250 hp. Salmson engines. The high speed at ground level is stated to be 142 m.p.h., and the speed at 13,000 ft. 123 m.p.h.

Levasseur

This firm, which is chiefly known as a propeller manufacturer, exhibited a torpedo carrier fitted with a 600 hp. Renault engine, and a three-seater sport airplane fitted with a 180 hp. Hispano-Suiza engine, known as Model TO3.

No data are on hand regarding the torpedo carrier, which was exhibited in skeleton form, but the Model TO3 afforded an interesting example of a civil airplane built on entirely new lines. As may be seen in the line drawings under (N), the Levasseur sport airplane is built around a huge Vee of three-ply frames which are more or less shaped like Lepere interplane struts, and which constitutes the basic structure of the whole machine. The monoplane wings are attached to the upper ends of this Vee, the engine section to its central portion, while its apex forms part of the landing gear. From the central horizontal struts of these Vees two three-ply girders run back to the tail unit, where they meet a duralumin tube which abuts at the other end against the apex of the Vee. On these two beams is built up a light framework of three-ply bulkheads and stringers, covered with fabric.

The forward section of the fuselage, housing the engine, is a separate unit, and three sections of the fuselage can be taken down by removing a few bolts. As may be imagined from this summary description, the machine has very few small parts, so repairs and replacements should be particularly easy. As the TO3 is specially designed for touring and instruction purposes, this feature is very important. Part of the wing construction is shown under (P).

The Levasseur firm also exhibited a variable pitch propeller which is stated to have successfully passed a 10-hr. test run at the technical establishment of the French air service.

Lioré et Olivier

On this stand were exhibited two metal airplanes, one a combat machine, and the other a low altitude pursuit machine.

The former, model LEO7, is a twin tractor biplane with central fuselage and two outboard engine nacelles. The machine is equipped as a three-seater, and is fitted with two 300 hp. Hispano-Suiza engines. The fuselage is built of four duralumin tube longerons and of similar cross-pieces, which are riveted to sheet duralumin fittings. At the rear of the fuselage sheet duralumin bulkheads take the place of the tubular cross-pieces, while the nose of the machine, where the forward gun turret is mounted, forms a separate unit of stamped sheet duralumin. This is riveted to the fuselage proper. The wings are built entirely of duralumin, but constructionally they do not differ from the practice followed in wooden wing construction. The interplane struts are fitted with adjusting gears, and the tail plane incorporates a variable incidence gear. Both these gears are based on the use of a double threaded set screw, the outer thread working inside a nut, while the inner thread takes a bolt. The threads run in opposite directions. The engines are mounted in streamlined nacelles, the aft portion of which contains the fuel and oil tanks. The oil tank is of autogenously welded duralumin, and a portion of it forms an oil radiator.

This machine can also be equipped as a passenger carrier, in which case eight pay seats are fitted.

The Lioré & Olivier low altitude pursuit machine, known as Model LEO9, is a cantilever monoplane with the wings abutting against the bottom of the fuselage. The wings are of equal depth throughout the span, and are built of tubular spars and lattice ribs of duralumin, which are fabric covered. The fuselage is also of duralumin tubing. No wire bracing occurs in either wings or fuselage. Owing to the arrangement of the wings the LEO9 is naturally reminiscent of the Junkers Model J13 metal monoplane, known in this country as the JL6.

Morane-Saulnier

This veteran firm of monoplane constructors exhibited its model AR parasol monoplane fitted with the 80 hp. Rhone engine, which is sufficiently known in this country, and a new "parasol" monoplane, Model AU, fitted with the 120 hp. Rhone engine, which was built for free flight tests of thick aerofoils. The wings mounted on the Model AU during the Paris show have a bird like shape, with a double curvature in the transverse sense. That is, the wings increase in depth from the center section, where they are thin, and decrease again toward the tips.

Nieuport-Delage

The exhibit of this firm comprised the "sesquiplane" on

which Georges Kirsch won the Deutsch de la Meurthe Trophy race last fall, the Model 28CI high altitude pursuit airplane of the French air service, which is merely a modification of Sadi Lecointe's Gordon Bennett racer, and the Model 30T2 cabin machine.

This latter is not a new product, but merely a modification of the airplane this firm produced about two years ago for the Paris-London service. It is a tractor biplane fitted with a 420 hp Darracq-Coatalen (Sunbeam license) engine, and is equipped to carry seven passengers and a crew of two. In the older model the wings were heavily staggered backward, but on the new type the stagger has been considerably decreased. A view of this machine appeared in our preceding issue.

From the viewpoint of design this machine does not present any new development. In comparison with the other Nieuport-Delage machines exhibited, which are both remarkable for the amount of thought that has been expended in decreasing parasite resistance to a minimum, the 30T2 almost looks obsolete.

Henry Potez

The stand of this firm shows a three-engined cabin airplane which was built to answer the requirements of the French ministry of colonies, a single engined night pursuit and observation airplane, and the Model IX five seater cabin biplane which was described in these columns before, and which is used on the Paris-Warsaw air line.

The "colonial" passenger carrier, Model X, is a triple tractor biplane with one engine in the nose, and two in the outboard nacelles. The machine is built to take from ten to twelve pay seats and a crew of two. Constructionally it is of interest in that the fuselage is of conventional wood construction, with longerons and bulkheads, while the wings are with the exception of the covering, of metal construction. The wing construction is illustrated in the line drawings under (K), from which it will be seen that while the wing spars are of I section, they are built up of four strips, riveted together, so that they actually form a box spar. The ribs are of U section lattice work, and while they are of very light weight, static tests have shown them to have a safety factor of 10.

The landing gear is of the three unit type, two units occurring under the engine nacelles, and one under the nose. Unlike in most of the newer passenger carriers, the pilot's cockpit is not placed in front, but aft of the wings.

Perhaps the most interesting feature of this machine is the use of two trimming rudders, which may be seen in the outline drawings under (A). These rudders are controlled from the cockpit by means of a hand wheel, and they answer the purpose of overcoming by a fixed setting the turning moment resulting from the failure of a wing engine. Despite the added mechanical complication such an arrangement involves, it is evident that on a large machine the use of trimming rudders would relieve the pilot of a not immaterial amount of strain and inconvenience, for once his trimming rudder is set at the proper angle, he will be able to fly the machine without having constantly to correct the turning moment. The piloting of a large machine introduces enough complications to warrant the adoption of any device that will keep the pilot in a normal state of mind, or prevent adding a further worry to his responsibilities.

The Model XV night observation and pursuit machine is a tractor biplane of conventional construction which is equipped as a two-seater. The fuselage is built up of wooden longerons with plywood bulkhead and covering, while the wings have a wooden framework and are covered with fabric. The interplane struts are streamlined duralumin tubes. The incidence of the tail plane is adjustable in flight.

Ricci Freres

This Italian firm, which specializes in the construction of very small airplanes, exhibited two tractor triplanes, one being a single-seater while the other is a two-seater. Owing to the very reduced dimensions of these machines—the span of the single-seater is only 11 ft., while that of the two-seater is 14 ft.—and the fairly good performance guaranteed (from 90 to 95 m.p.h.) they afford an interesting example of what may be done in the construction of "minimum" airplanes.

Sanchez-Besa

The most unusual airplane of the Paris show—although we hesitate to call it a freak—was undoubtedly that shown by M. Sanchez-Besa. This is a multiplane comprising twenty-one aerofoils of 6 in. chord which are attached by means of steel fittings to six sheet duralumin interplane struts. The resulting frame is mounted on an airplane body which may best be likened to that of the Caudron G3, that is, a nacelle combining the engine housing with the pilot's seat, and carrying the tail unit on outriggers as shown in (H). The tail surfaces follow standard practice, except as to construction. The aerofoils are built around a tubular duralumin spar, and consist of sheet duralumin covering which is internally stiffened by solidified cork. Some of these aerofoils can be rotated together with their spar, this being the only provision made for lateral control. The construction of the tail surfaces, though different in application, is based on the same principle.

The static tests of this type of aerofoil are said to have given remarkable results as to strength and lack of vibration. The outriggers and the landing gear struts are duralumin tubes, assembled with steel sleeve fittings.

As the Sanchez-Besa multiplane was designed by M. Toussaint, director of the Aerodynamical Laboratory at Saint-Cyr, who because of his position disposes of ample means for investigating new designs, this unusual airplane deserves more than passing attention. In this connection it is remarkable that none of the early reports of the Paris show printed in our London contemporaries seem to be aware of the fact that the basic idea of the Toussaint design is of English ancestry, being derived from the Phillips steam driven multiplane, known to all students of early aviation experiments. As the latter machine was built in 1893, and it actually left the ground on a circular course to the center of which it was attached by steel wires, the characteristics of the Phillips multiplane will be of interest. This machine had a span of 22 ft., an overall length of 25 ft., and a maximum height of 11 ft. The "wings" consisted of a steel frame to which were fitted some fifty aerofoils of 1.5 in. chord, and having a total area of 136 sq. ft. No tail surfaces were fitted. The power plant consisted of a steam engine developing about 9 hp. and driving a 6-ft. pusher propeller. The machine weighed empty 330 lb. including steam engine and boiler, to which a dead load was usually added in the trials. On June 19, 1893, after several trials had shown that the machine lifted off its track, the Phillips multiplane flew around its circular path for a distance of 2000 ft. at a speed of 40 m.p.h., with a total load of 385 lb. On account of the insufficient useful load, due to the heavy power plant, it was not possible to test the machine with a pilot on board, and this is why it was, for the trials, held captive to the center of the track.

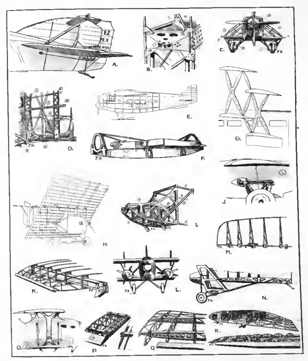
In view of the good lift obtained in these trials, always considering the crude workmanship and the heavy engines of the period, a resumption of experiments with a Phillips type multiplane is to be welcomed. In this connection M. Toussaint is of the opinion that the type of multiplane exhibited on the Sanchez-Besa stand will help to solve several important problems, among which he mentions greater facility in piloting and lower cost of upkeep. The latter point will be readily conceded, seeing how easily such a machine could be taken down, reassembled, and stored. As to its being easier to fly, practical experience alone will tell.

Societe Hollandaise d'Aviation

This new firm represents the Fokker airplanes in France. Its exhibit consisted of a Fokker F3 cabin monoplane, a type which is fairly well known in this country owing to several long cross country flights made by the machines belonging to the Netherlands Aircraft Corp. of New York.

S. E. C. M.

The S. E. C. M. firm are specialists in industrial metal construction, and their advent in the aircraft field will therefore be watched with interest. At the Paris show they exhibited a two-seater side-by-side sport airplane, called Lutèce 20, which is fitted with the 110 hp. Rhone engine. The chief point of interest in this machine is that it is largely built of dure-



CONSTRUCTIONAL DETAILS AT THE PARIS AERO SHOW: A—POTEZ X, B—WIBAULT, C AND D—BREGUET LEVIATHAN, E—ERNOUL, F AND G—BESSON H5, H—SANCHEZ-BESA, I—HANRIOT HD18, J—FBA, K—POTEZ X, L—LATECOERE LAT6, N AND P—LEVASSEUR, O—BREGUET 19A2, Q AND R—WIBAULT.

lunun tubing which is neither joined by means of welding or riveting. The actual system of assembly, which is patented, is difficult to describe within the restricted space available, but put briefly it is the following. Where two tubes meet, one tube end is stamped into a circular flange which acts as the socket for the other tube, to make the two tubes keep their relative position, the junction points of the tubes are trussed by wires to other junction points.

Rene Tampier

Rene Tampier exhibited a tractor biplane intended for sport purposes (illustrated in our preceeding issue) which can be run on the ground by means of a low powered auxiliary engine with transmission to the wheels of the landing gear, where a differential is provided. When it is desired to run on the ground, the wings are folded back against the fuselage, as may be seen in the illustration above referred to, and an auxiliary running gear, which in flight folds into the fuselage, is lowered. This running gear is connected up to the rudder bar, so the pilot can steer the machine by the habitual movement of his feet. The idea back of this arrangement is that if the machine should have a forced landing it could proceed to the nearest town by using the vehicular roads. The idea is fascinating though its practical value may seem doubtful.

Michel Wibault

The firm of Michel Wibault exhibited an all metal night bombardment airplane built to the requirements of the French air service. This machine is chiefly of interest on account of the visible efforts of this constructor to turning duralumin airplane construction into a fairly cheap production job. Most of the other all metal or part metal structures exhibited at the Paris show or any other known type, for that matter, while highly interesting from the viewpoint of experimentation, hardly appear to be production jobs, and even if they were the cost would be well nigh prohibitive.

M. Wibault's solution consists in employing in the wing construction duralumin, in built-up form, for the spars, and in using duralumin tubing in lattice work form for the ribs and the contour elements. This construction is illustrated in the accompanying line drawings under (Q) and (R), while (B) shows the wing root construction on the fuselage. It is interesting to note that the Wibault wing weighs only 1.2 lb per square foot of area, or about the same weight as a corresponding wing built of wood and fabric, while its aerodynamical features are, on account of the lessening of frictional resistance, evidently superior, as the wing covering is of smooth sheet duralumin. In the static tests conducted by the engineering section of the French air service the Wibault wings were loaded to a safety factor of 7.5 without showing any permanent change in form.

The wing curve employed on this machine is one M. Wibault developed after a lengthy study of the *Technische Berichte* of the Goettingen Laboratory. Having reached the conclusion that the fairly thick wings afford a good compromise between the conflicting requirements of high speed, ceiling and load carrying, he was led to investigate the possibilities of such wings embodying the feature of variable profiles, that is, wing sections of the same profile but varying in dimensions. The wing curve used on the Wibault night bombardment airplane is the result of this investigation.

The characteristics of this machine, given in the table accompanying our preceeding article on the Paris show, indicate that the useful load carried exceeds the weight empty (weight empty 4620 lb., useful load 4840 lb.), which furnishes an interesting indication of the advantages that may be derived from the use of modern high lift wings and improved metal construction.

Trials of the Pescara Helicopter

In the course of trials carried out at Barcelona, the helicopter invented by the Spanish engineer Senor Pescara, is stated to have risen 3 ft. from the ground, the inventor then demonstrated that the machine could tilt either backward or forward and turn in a circle. These trials were carried out in a garden 50 ft. long and 30 ft. wide, while a wind of 20 m.p.h. was blowing. No cables or gas balloons were used as supports.

Men Who Made the Kansas City Flying Meet a Success

The Above Picture Shows a Group of Members of the Active Kansas City Flying Club. Left to Right—Lower Row—James B. Harvey, Harry C. Dille, Dudley M. Steele, R. B. Barnitz, R. R. Lester, R. R. Nolano, Clifford Kiou. Second Row—Bernard Conway, Marian Sharg, A. A. Hamilton, Simpson Yeomans, Howard F. Wehrle, James K. Walker, Terrance W. Imes, E. C. Meservey, Jr. and Dix Edwards. Third Row—William S. Green, Byron Spencer, Hubert Shelley, Dorman O'Leary, Lawrence Winn, Ray Ferris and Cliff Hogan. Fourth Row—Lewis Keplinger, C. W. Smith, William B. Stone, T. N. Roby, Charles Carpenter, Roe F. Montgomery and Leroy Farmer. Fifth Row—Fred Mann, Francis Poindexter, Norman Wilkinson, R. L. Morse and M. H. Davis

The Detroit Aerial Water Derby

Regulations Governing Curtiss Marine Flying Trophy, Class and Invitation Events to be Held September 1922

The following rules and regulations for the Detroit Aerial Water Derby, which is to be held in September, 1922, have been issued by the Contest Committee of the Aero Club of America.

Curtiss Marine Trophy

(1) The trophy shall be perpetual and competed for annually by seaplanes and flying boats.

(2) The contest shall be in the nature of a race either around a closed circuit or from point to point. The rules governing the race each year to be drawn up by the Contest Committee of the Aero Club of America.

(3) The trophy shall be awarded each year to the Aero Club represented by the pilot of the winning machine, and this Club shall be entitled to the possession of the trophy until one month prior to the next succeeding contest, at which time the trophy shall be returned to the Aero Club of America. The Contest Committee of the Aero Club of America, with the consent of the Board of Governors, has the privilege of conducting each annual contest for the Curtiss Marine trophy, or of assigning this privilege, under sanction, to any other Club or organization.

Conditions of Contest

(1) *Free-for-all for Flying Boats and Seaplanes.*

(a) Factor of safety. Monoplanes, six as loaded for start of race; biplanes, four as loaded for start of race.

(b) Air speed greater than 70 m.p.h., as loaded for start of race.

(c) Visibility, and maneuverability (water and air) which in opinion of Contest Committee, Detroit Aviation Society, is not a menace to the other contestants or spectators.

(2) *Distance, Approximately 160 Miles.*

Eigth times around a closed course of 20 miles.

3. *Rules of the Race.* (a) Upon receiving the getaway signal for the start, pilots shall hold a straight course and not cross or attempt to cross in front of the planes on either side.

(b) From a standing start contestants will fly around the first four laps of the course, and during the last four laps will be obliged to alight on the water and while running along the surface of the water enter into and pass through, in the proper direction, the water controls which shall be designated by moored markers on both sides. After passing out of a water control contestants must take the air and fly at least one-half the distance to the next water control.

Note. (There will be two or more water controls on each lap and at least one will round a turning mark.)

(c) While within the markers bounding the water controls, the contestants must maintain constant contact between the water and fixed surfaces of the principal flotation gear (wing or tail pontoons, or water rudder, or any other adjustable, movable or flexible attachment is not sufficient contact with the water, under this rule.)

(d) A plane overtaken, both planes being in the air, must hold its altitude and a true course, in order that it may not in any way impede or interfere with the faster overtaking plane.

(e) A plane overtaking a slower plane, both planes being in the air, shall never pass or attempt to pass between that plane and any pylon or object used to mark a turning point.

(f) Within the water controls, both planes being on the water, the overtaking plane must pass to the left, and all mechanicians of competing planes must look to the rear and warn pilots of an overtaking plane. Pilots of overtaken planes must keep to the right and give the faster overtaking plane room to pass on the left.

(g) The finishing line must be crossed in flight—not on the water—and after crossing the finishing line, all planes shall continue on their course until they have attained sufficient altitude to enable them to turn and land without crossing the course or finishing line.

(h) No contestant shall start before he receives the getaway signal.

(i) Pilots shall pass outside all turning points and in plain view of officials stationed at each point, and at an altitude of not more than 250 ft.

Fouling a Mark. "Any competitor who has failed to turn a stake properly may validly continue on the circuit provided he makes a complete turn of the said stake and then continues his trip in the same direction." F.A.I. Rules, Art. 115.

(j) No contestant shall be permitted to "dope" the fuel with picric acid, ether, or similar highly explosive liquids. Benzol and similar anti-knock fuels may be used.

4. *Start.* (a) The starting signal will be given at — a. m. Planes to be in their allotted places at — a. m. Pilots meeting for the final instructions to be announced later.

(b) Position at start. Planes competing for class and invitation prizes in addition to Curtiss Marine Trophy will be sent away together in a class, the faster classes starting before slower. Competitors for Curtiss Marine Trophy only will be sent away together after the classes.

(c) Method of starting. Contestants will be lined up along the shore in shallow water for the start. The starter will assign an assistant starter to each plane who shall raise the signal flags for its pilot, as follows. The starting signal (for motors only) a red flag will be raised by the chief starter at — a. m. When the motor on each plane is running, the assistant starter assigned to that plane will raise the red starting flag. When all assistants have raised the red starting flags, but not later than — a. m., the starter will raise, in addition to the red starting flag, the white warning flag, which signifies that the getaway signal will be given in ten seconds; each second will be counted by lowering the red flag, the getaway signal being the lowering of both red and white flags. If any contestant has difficulty in starting his motor, his assistant starter will not raise the red starting flag, but, when the chief starter raises the white warning flag, will raise a blue flag, which is a request for a deferred start. Deferred starts shall be granted without penalty, except that no plane will be started after a delay of two hours.

5. *The Finish.* The finishing time will be taken when each plane flies across the finishing line between the marks defining this line, after having completed the full course, 160 miles.

6. *The Winner.* Of each first place shall be the pilot which has completed the full course in the shortest elapsed time, and of each second place, the second best time, etc., provided the pilot is not disqualified. The Curtiss Marine Trophy will be awarded to the club represented by the pilot and the prize money paid to the entrant of the winning seaplane or flying boat. Agreements between pilots and entrants as to their portional share of the prize money will be upheld by the Contest Committee who will pay the prize money in accordance with agreements in writing between pilots and entrants, presented to the Contest Committee prior to the race or within 24 hours after the finish of the race.

7. *Qualifications.* No seaplane or flying boat may take part in the contest unless it is piloted or commanded by a pilot, who must be on board and who must be furnished with a license issued by the Contest Committee of the Aero Club of America. (F.A.I. Rules, Art. 67). Every person furnished with Pilot's certificate of F.A.I. may obtain license issued optionally by Contest Committee, Aero Club of America. (F.A.I. Rules, Art. 70). A license will be valid until the 31st December of the current year. The Contest Committe, Aero Club of America, may, upon the occasion of any competition or test, issue temporary license as pilot for this one test only, to any person whose qualifications it considers sufficient. F.A.I. Rules, Art. A-28.

8. *Disqualifications.* Any contestant breaking the above rules of the race, or subsequent ones which may be sent out in writ-

ing shall, upon recommendation of the judges, be disqualified.

"Every person organizing or taking part in a sporting event of whatsoever nature, is supposed (1) "To know the present regulations (F.A.I. rules) thoroughly." (2) "To agree to submit without restriction to the consequences that result therefrom." (F A I Rules, Art. 7)

9. *Protests.* No protest shall be considered unless presented in writing to the Contest Committee of Detroit Aviation Society, within twenty-four hours after the finish of the race (F A I Rules, 78, 79, 80) (Appeals. See F.A.I Rules, Art. 178-179)

10 *Numbers* Each plane shall have the number assigned to it by the Contest Committee, painted on the bottom surface of lower wing and on each side of the fuselage, clear of the wing, in characters as large as possible. It shall have no other numbering over twelve inches in height

11. *Advertisements* "Competitors are forbidden to display on their apparatus or material any commercial advertisement except the trade-mark of the constructor of the apparatus." (F A I Rules, Art 89)

NOTE The word plane as used in these rules means flying boats or seaplanes.

Additional Prizes

The (to be announced later) prizes for greatest air speed will be awarded to the contestant who, during the Curtiss Marine Trophy race, completes laps 2, 3 and 4 in the shortest total elapsed time (The first lap is not included because of the standing start).

Additional prizes will be awarded for Class or Invitation races to be announced by the Contest Committee of the Detroit Aviation Society after entries have closed.

(a) *Class Races.* Four or more planes of the same design and equipped with the same motor shall constitute a class.

Class Rule Planes eligible for class races are those constructed under the same design and general specifications and not altered to materially change these specifications, nor to prevent the interchange of any corresponding part or parts of any two planes.

Furthermore, should any interchange of corresponding part or parts be directed under this rule, the plane must remain the same after the interchange from the standpoint of design and operation

Exceptions Streamlining which does not alter the structure of the part or parts stream-lined.

Motors eligible for class races are determined by the above rule and these exceptions

(1) Stream-lining which does not alter the structure of the part or parts stream-lined

(2) Motors may be equipped with any make or design of propeller, ignition, spark plugs, carburetor, including intake manifold, exhaust manifold, gasoline and oil systems

(b) *Invitation Races* The Contest Committee of the Detroit Aviation Society may invite any of the entrants to compete for a special prize

Entries

Free entries close July 31, 1922.
25 per cent penalty entries close Aug. 7, 1922
50 per cent penalty entries close Aug. 13, 1922.

The entry fee, $100.00, will be refunded if the contestant is in his allotted place ready to start in the contest provided the entry is received before July 31 Entries received after July 31 but prior to August 7 will be penalized $25.00 Entries received after August 7 but prior to August 13 will be penalized $50.00 After August 13 entries will only be accepted with the written consent of all other entrants and the entry fee of $100.00 will not be refunded.

R.A.F. in Mesopotamia

It is now officially announced that from February 1, 1922, the Irak (Mesopotamia) Group of the Royal Air Force, which is at present part of the Middle East Area, will be separated from that area, and will become an independent command The Officer Commanding Irak Group will be directly responsible to the Air Ministry for the command and administration of the Air Force units located in that country.

called Napoleon III ... feint Maximilian, an ... duke, upon the throne ... America, beware!

It is by the abounding ... over two million French ... dead now moldering ... just that Mr. Wells b... his echoes of Wil... English League, ... d German. He ... outline of Ingrati...

A Holiday for ...

Now that Senator ... Ohio, and Senator K... have obtained all the ... is to be had out of th... day resolutions, let ... until the President an... call upon them for an... two gentlemen migh... chosen some other me... the folks back home th... Washington.

Mr. Pomerene and ... the simplest of telegr... addressed to the Navy ... could have learned tha... necessary for their reso... tically all of the 1921 ... appropriation has be... Work has ceased on so... on others it is being c... reduced pace

It is to be hoped th... Affairs Committee wil... lutions due a proper ... death. The committee ... ety might suggest to the... men from Ohio and U... go on a holiday until t... has adjourned

A Tribune R...

Who Has Always Lik... and Writes to S...

To the Editor of The Tr...

Sir: You will probabl... ter odd, for it is one o... and yet the writer ho... more like it are sent to ... Years ago, it seems, I ... and there learned somet... gineering, things litera... things not mentioned in t... One of these was learnin... appreciate The Tribune ... began the initiation into ... for me, which continued ... war We both liked it ... qualities, even though I ... the Hughes-Wilson episo... Together we often rea... both enlisted as reading ... into the big show. I st... went over, and remaine... yet in his letters he o... the pleasure it gave him ... when he found a Tribune ... wear, but still The Tribu...

To-day, a Philadelphi... awoke from the sleep of ... read the front of his... newspaper. Rarely have ... thing like it. Devoid of ... news or La Vrai à la R... adequately express the ... are it gave the reader

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THE Aircraft Service Directory

WHERE TO PROCURE EQUIPMENT AND SERVICES